

PROJECT NUMBER: 1758
PROJECT TITLE: Tobacco Cell Wall Research
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I. SIDESTREAM REDUCTION (S. Baldwin, B. Goodman, J. Paine and B. Rogers)

A. Objectives: (1) To prepare handsheets using inorganic paper fillers with different physical and chemical properties to be evaluated for effectiveness in sidestream smoke reduction; (2) to prepare coated bobbins of paper for the same purpose; (3) to obtain new or different paper-making materials of possible value in sidestream smoke reduction.

B. Results: A series of 24 handsheets were prepared at the University of Maine with calcium carbonate fillers covering a range of particle sizes from 0.02 microns to 2 microns, with surface areas of 7 m²/g to 72 m²/g. Physical properties of the sheets have been determined. Permeability matches were obtained for three sets of handsheets with fillers of very different surface areas. Additionally, handsheets with the same Coresta permeability were prepared with both calcium carbonate and magnesium carbonate of the same particle size. Preliminary sidestream reduction results with magnesium carbonate had shown promise.

Samples of alternate counterion CMC have been received from Aqualon. Potassium, calcium, magnesium and ammonium ions have been substituted for sodium in carboxymethylcellulose. Two bobbins of paper obtained from Kimberly Clarke were treated with potassium succinate and coated with two types of carboxymethylcellulose (CMC). One bobbin was coated with standard sodium CMC as a control. The other bobbin was coated with a new product in which the NH₄⁺ ion completely replaces the sodium.

A number of cellulose derivatives were suggested as possible paper coatings to provide spotting protection for cigarettes prepared from ART tobacco.¹

A laboratory size coating unit has been ordered to apply sizing and other materials to the handsheets. Rolls of paper produced at the University of Maine were split and prepared for splicing into bobbins suitable for coating and running on the maker.

Refining curves were repeated in the new handsheet facility. Flax fiber was regenerated from cigarette paper, but the porosity of the resulting sheet was higher than that of the parent sheet. Fines may have been lost, or the pH may not have been high enough to adequately swell the fibers.

A sample of a precipitated dolomite with a high surface area, 26 m²/g, has been received from Pfizer. A sample of a slurried high surface area carbonate has also been received. Samples of aluminum hydroxide magnesium carbonate, hydrotalcite, and

magaldrate have been submitted for SEM examination to determine particle size and structure.

A database has been established to retain the data for the various papers prepared to date.

C. **Plans:** The handsheets prepared will be chemically treated, pending the arrival of the coater. Cigarettes will then be prepared for evaluation for light extinction. Eight additional bobbins of paper will be prepared at the University of Maine for coating with the alternate counterion CMC's and with the thermoplastic cellulose derivatives. Hand sheets will also be prepared with the new inorganic fillers which have been received.

D. **Reference:**

1. Baldwin, S., memo to W.G. Houck, "Suggestions to Address the Spotting Problem in ART Cigarettes," October 7, 1988.

II. **ESTIMATION OF BLEND COMPOSITION FOR CARTIER AND FRONTIER CIGARETTES**

(G. Bokelman, J. Stimler and General Analytical)

- A. **Objectives:** As requested by W.G. Houck, determine the estimated blend composition of two brands of Cartier, Regular and Pearl Tipped. Also, as requested by C.R. Lambert, predict the blend composition of three new brands of cigarettes introduced on the Japanese market by Japan Tobacco, Inc. (JTI): Frontier Regular, Frontier Menthol, and Frontier Lights.
- B. **Results:** Cartier cigarettes were of interest because they have an extremely low incidence of spotting. The predicted blend compositions for the Cartier cigarettes are shown in Table 1. These two brands are notable for their high contents of bright lamina and absence of Oriental leaf. It appears unlikely that the "secret" of the lack of spotting by Cartier cigarettes is somehow related to a novel or unusual blend composition. However, these tobacco blend components could be processed in a different manner.

Table 1. Predicted Blend Compositions for Cartier Cigarettes
(values expressed as percentage of total)

<u>Component</u>	Cartier	Cartier
	<u>Regular</u>	<u>Pearl Tipped</u>
Bright Lamina	62	68
Burley Lamina	15	17
Oriental Leaf	0	0
Stem	23	15

The predicted blend compositions for the three new cigarette brands from JTI are shown in Table 2. It is apparent that all three brands have the same tobacco blend composition. This one common blend is similar to that of SomeTime Lights (from JTI) and Marlboro Lights (Japan). Compared to SomeTime Lights, the Frontier blend contains more burley lamina and Oriental leaf, but it has a lower content of (combined bright and burley) stems.

Table 2. Predicted Blend Compositions for New Cigarettes Introduced by
JTI
(values expressed as percentage of total)

<u>Component</u>	<u>SomeTime</u> <u>Lights</u>	<u>Frontier</u> <u>Regular</u>	<u>Frontier</u> <u>Menthol</u>	<u>Frontier</u> <u>Lights</u>
Bright Lamina	41	42	43	40
Burley Lamina	29	32	32	33
Oriental Leaf	6	8	10	8
Stem	25	18	16	18

- C. **Plans:** No additional cigarettes are currently being evaluated for blend composition estimation.

III. CHARACTERIZATION OF TOBACCO HEMICELLULOSE (S. Baldwin)

- A. **Objective:** Characterize hemicellulose isolated from green Coker 319 tobacco.
- B. **Results:** As part of a collaborative contract research project, Dr. Norman Lewis at VPI&SU sent us a crude sample of hemicellulose that had been extracted from green Coker 319 tobacco grown in the greenhouse at Philip Morris. Recently an additional three samples of tobacco hemicellulose were received. Based on differences among the gel permeation chromatograms of these samples and differences in their neutral sugar analyses, it was concluded that these samples consist of differing ratios of the same, or in some cases slightly different, components. Fractions believed to represent different components were collected. Neutral sugar analyses confirmed that these were indeed different components. The components were found to have the following compositions:

1. arabinose:xylose:galactose:glucose molar ratios of
1: 7.8:1.35:21.2
2. rhamnose:arabinose:xylose:galactose:glucose molar ratios of
1:1.67:3.2:3.2:10.2

Methylation analysis of the original unseparated hemicellulose sample and on the more soluble components revealed the following:

Original sample: t-arabinose, t-xylose, t-glucose, t-galactose, 1,4-glucose, 1,4-galactose, 1,4-xylose, 1,4,6-mannose, and 1,4,6-glucose.

"Soluble sample": t-arabinose, t-xylose, t-glucose, t-galactose, 1,4-glucose, 1,4-galactose, 1,4-xylose,

- C. **Plans:** The individual components within these various samples of tobacco hemicellulose will be isolated and more completely characterized.

IV. EVALUATION OF FLAVOR BEADS FROM PREMIER (S. Tafur)

- A. **Objectives:** Determine whether deoxyfructosazines (DOF's) were present in Premier flavor beads.
- B. **Results:** Nicotine was extracted from the flavor beads from 40 Premier cigarettes in order to check its enantiomeric purity.¹

Water and methanol extracts of the flavor beads of Premier cigarettes were prepared and examined by LC for detectable levels of deoxyfructosazines (DOF's). These compounds are considered indicative of the presence of some reaction flavors involving fructose and glucose. No definitive peaks were observed in the expected retention region for DOF's. Further examination of the extracts for tobacco glycosides which might occur in a tobacco extract used as a flavorant did not indicate any appreciable level of glucosides.²

- C. **Plans:** No further work is planned.

D. **References:**

1. Core, M., Izac, R., Tafur, S., "Enantiomeric Purity of Nicotine from Premier Flavor Beads," memo to R. Ferguson, October 10, 1988.
2. Tafur, S., "LC Examination of Extracts of Premier Flavor Beads," memo to R. N. Ferguson, October 14, 1988.